AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior listings of claims in this application.

1-51. (Canceled).

52. (Previously presented) A catalytic composition for upgrading high molecular weight hydrocarbons comprising an admixture of water and the reaction products of particles of the following components: silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt, wherein the particles have a Blaine surface area to weight ratio of at least 3000 cm^2/gm.

53. (Previously Presented) A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising the catalytic composition of claim 52 and a C_5 to C_{25} alkane or cycloalkane.

54. (Currently Amended) A catalytic composition for upgrading high molecular weight hydrocarbons comprising an admixture of water and the reaction products of particles of the following components: ~~A composition of claim 53, wherein the weight percents of the components are as follows~~:

i. about 15 to 35 weight percent silicon dioxide,

ii. about 1 to 6 weight percent aluminum oxide,

iii. about 5 to 20 weight percent ferric oxide,

iv. about 10 to 30 weight percent calcium oxide,

v. at least about 2 weight percent titanium dioxide or boron oxide, and

vi. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (vi), and the composition comprises up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the composition.

55. (Previously Presented) The composition of claim 53, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

56. (Previously Presented) The catalytic composition of claim 52, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

57. (Previously Presented) An admixture of a high molecular weight hydrocarbon and the catalytic composition of claim 52 wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

58. (Previously Presented) The admixture of claim 57 wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

59. (Previously presented) A catalytic composition comprising an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, wherein the particles have a Blaine surface area to weight ratio of at least 3000 cm^2/gm.

60. (Previously Presented) A composition for the upgrading of a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising the catalytic composition of claim 59 and a C_5 to C_{25} alkane or cycloalkane.

61. (Currently Amended) A catalytic composition comprising an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, ~~The composition of claim 60,~~ wherein the weight percents of the components are as follows:

i. 30 to 50 weight percent cement component,

ii. 30 to 50 weight percent volcanic ash component,

iii. at least 2 weight percent titanium dioxide or boron oxide, and

iv. at least 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (iv), and the composition comprises up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the composition.

62. (Previously Presented) The composition of claim 60, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

63. (Previously Presented) The catalytic composition of claim 59, wherein the cement component is Portland cement.

64. (Previously Presented) The catalytic composition of claim 59, wherein the volcanic ash component is one or more components selected from scoria, basalt, pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, mafic rock, ultramafic rock, and silicate-based zeolites.

65. (Previously Presented) The catalytic composition of claim 59, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

66. (Previously presented) A catalytic composition comprising an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, wherein the particles have a Blaine surface area to weight ratio of at least 3000 cm^2/gm, the volcanic ash component is scoria or a mixture of scoria and basalt, the transition metal salt is ferric chloride and the catalytic composition comprises at least 2 weight percent of titanium dioxide.

67. (Previously Presented) An admixture of a high molecular weight hydrocarbon and the catalytic composition of claim 59, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

68. (Previously Presented) The admixture of claim 67, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

69. (Previously presented) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm of silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt; and

(b) blending the admixture with water.

70. (Currently Amended) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm of silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt; and

(b) blending the admixture with water

~~The method of claim 69~~, wherein the weight percents of the components are as follows:

i. about 15 to 35 weight percent silicon dioxide,

ii. about 1 to 6 weight percent aluminum oxide,

iii. about 5 to 20 weight percent ferric oxide,

iv. about 10 to 30 weight percent calcium oxide,

v. at least about 2 weight percent titanium dioxide or boron oxide, and

vi. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (vi).

71. (Previously Presented) The method of claim 69, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

72. (Canceled).

73. (Previously Presented) The method of claim 69, further including blending the admixture with a C_5 to C_{25} alkane or cycloalkane.

74. (Previously Presented) The method of claim 73, wherein the admixture is blended with up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the admixture and the C_5 to C_{25} alkane or cycloalkane.

75. (Previously Presented) The method of claim 73, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

76. (Previously presented) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide; and

(b) blending the admixture with water.

77. (Previously Presented) The method of claim 76, wherein the weight percents of the components are as follows:

i. about 30 to 50 weight percent cement component,

ii. about 30 to 50 weight percent volcanic ash component,

iii. at least about 2 weight percent titanium dioxide or boron oxide, and

iv. at least about 8 weight percent transition metal salt,

the weight percents being based on the total weight of components (i) - (iv).

78. (Previously Presented) The method of claim 76, wherein the cement component is Portland cement.

79. (Previously Presented) The method of claim 76, wherein the volcanic ash component is one or more components selected from scoria, basalt, pyroclastic rock, tuff, tuffstone, volcanic glass, pumice, mafic rock, ultramafic rock, and silicate-based zeolites.

80. (Previously Presented) The method of claim 76, wherein the transition metal salt is one or more of the compounds selected from ferric halides, cupric halides, cobalt halides, and ferrous halides.

81. (Canceled).

82. (Previously Presented) The method of claim 76, further including blending the admixture with a C_5 to C_{25} alkane or cycloalkane.

83. (Previously Presented) The method of claim 82, wherein the C_5 to C_{25} alkane or cycloalkane is diesel fuel or naphtha.

84. (Previously Presented) The method of claim 82, wherein the admixture is blended with up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the admixture and the C_5 to C_{25} alkane or cycloalkane.

85. (Currently Amended) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting, in the liquid phase, the catalytic composition of claim 52 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

86. (Previously Presented) The method of claim 85, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

87. (Previously Presented) The method of claim 85, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

88. (Previously Presented) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting a catalytic composition with a high molecular weight hydrocarbon at ambient temperature and pressure to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition,

wherein said catalytic composition comprises an admixture of water and the reaction products of particles of the following components: silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt, said particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm.

89. (Currently Amended) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting, in the liquid phase, the composition of claim 54 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a),

the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

90. (Previously Presented) The method of claim 89, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

91. (Previously Presented) The method of claim 89, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

92. (Previously presented) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting a catalytic composition with a high molecular weight hydrocarbon at ambient temperature and pressure to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition,

wherein said catalytic composition comprises an admixture of water and the reaction products of particles of the following components: silicon dioxide, aluminum oxide, ferric oxide, calcium oxide, titanium dioxide or boron oxide, and a transition metal salt, said particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm and the weight percents of the components are as follows:

i. about 15 to 35 weight percent silicon dioxide,

ii. about 1 to 6 weight percent aluminum oxide,

iii. about 5 to 20 weight percent ferric oxide,

iv. about 10 to 30 weight percent calcium oxide,

v. at least about 2 weight percent titanium dioxide or boron oxide, and

vi. at least about 8 weight percent transition metal salt,

said weight percents being based on the total weight of components (i) - (vi), and the catalytic composition comprises up to 50 weight percent C_5 to C_{25} alkane or cycloalkane, based on the total weight of the catalytic composition.

93. (Currently Amended) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting, in the liquid phase, the catalytic composition of claim 59 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a),

the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

94. (Previously Presented) The method of claim 93, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

95. (Previously Presented) The method of claim 93, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

96. (Previously presented) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting a catalytic composition with a high molecular weight hydrocarbon at ambient temperature and pressure to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition,

wherein said catalytic composition comprises an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, said particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm.

97. (Currently amended) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting, in the liquid phase, the composition of claim 61 with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a),

the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

98. (Previously Presented) The method of claim 97, wherein the high molecular weight hydrocarbon composition is one or more components selected from bitumens, asphaltenes, oils, and tars.

99. (Previously Presented) The method of claim 97, wherein the weight ratio of the high molecular weight hydrocarbon to the catalytic composition is from 2:1 to 4:1.

100. (Previously presented) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting a composition with a high molecular weight hydrocarbon at ambient temperature and pressure to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a), the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition,

wherein said composition comprises an admixture of water and the reaction products of particles of a cement component, a volcanic ash component, a transition metal salt, and titanium dioxide or boron oxide, said particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm and the weight percents of the components are as follows:

i. 30 to 50 weight percent cement component,

ii. 30 to 50 weight percent volcanic ash component,

iii. at least 2 weight percent titanium dioxide or boron oxide, and

iv. at least 8 weight percent transition metal salt,

said weight percents being based on the total weight of components (i) - (iv), and the composition further comprises a C_5 to C_{25} alkane or cycloalkane in an amount up to 50 weight percent, based on the total weight of the composition.

101-104 (Canceled)

105. (New) A catalytic composition comprising an admixture of water and the reaction products of particles of a (i) cement component, (ii) a volcanic ash component comprising scoria or a mixture of scoria and basalt, (iii) a transition metal salt, and (iv) titanium dioxide or boron oxide, wherein the particles have a Blaine surface area to weight ratio of at least 3000 cm^2/gm

106. (New) A method of making a catalytic composition for the upgrading of a high molecular weight hydrocarbon composition which comprises:

(a) admixing particles having a Blaine surface area to weight ratio of at least 3000 cm^2/gm of (i) a cement component, (ii) a volcanic ash component comprising scoria or a mixture of scoria and basalt, (iii) a transition metal salt, and (iv) titanium dioxide or boron oxide; and

(b) blending the admixture with water.

107. (Newly presented) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting (i) a catalytic composition comprising an admixture of water and the reaction products of (A) particles of a cement component, (B) a volcanic ash component comprising scoria or a mixture of scoria and basalt, (C) a transition metal salt, and (D) titanium dioxide or boron oxide, wherein the particles have a Blaine surface area to weight ratio of at least $3000cm^2/gm$ with (ii) a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a),

the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.

108. (New) A method of cracking a high molecular weight hydrocarbon composition to form a lower molecular weight hydrocarbon product, comprising:

(a) contacting a catalytic composition comprising an admixture of water and the reaction products of particles of:

i. 30 to 50 weight percent of a cement component,

ii. 30 to 50 weight percent of scoria or a mixture of scoria and basalt,

iii. at least 2 weight percent of titanium dioxide or boron oxide,

iv. at least 8 weight percent of transition metal salt,

the weight percents being based on the total weight of components (i) - (iv), wherein the particles of a Blaine surface area to weight ratio of at least $300cm^2/gm$,

and up to 50 weight percent of C_5 to C_{25} alkane or cycloalkane, based on the total weight of the composition, with a high molecular weight hydrocarbon to hydrogenate and crack the high molecular weight hydrocarbon; and

(b) recovering the lower molecular weight hydrocarbon product formed in step (a),

the lower molecular weight product having an average API value greater than the API value of the high molecular weight hydrocarbon composition.